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Proctor, Jr.

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(45) **Date of Patent: Oct. 29, 2002**

(54) **METHOD AND APPARATUS FOR ADAPTING ANTENNA ARRAY TO REDUCE ADAPTATION TIME WHILE INCREASING ARRAY PERFORMANCE**

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(73) Assignee: **Tantivy Communications, Inc.**, Melbourne, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/776,558**

(22) Filed: **Feb. 2, 2001**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 09/579,084, filed on May 25, 2000, now Pat. No. 6,304,215, which is a division of application No. 09/210,117, filed on Dec. 11, 1998, now Pat. No. 6,100,843, which is a continuation of application No. 09/157,736, filed on Sep. 21, 1998, now abandoned.

(51) **Int. Cl.**[7] **H01Q 3/24**
(52) **U.S. Cl.** **342/372**; 342/373
(58) **Field of Search** 342/367, 368, 342/372, 373; 455/422, 426

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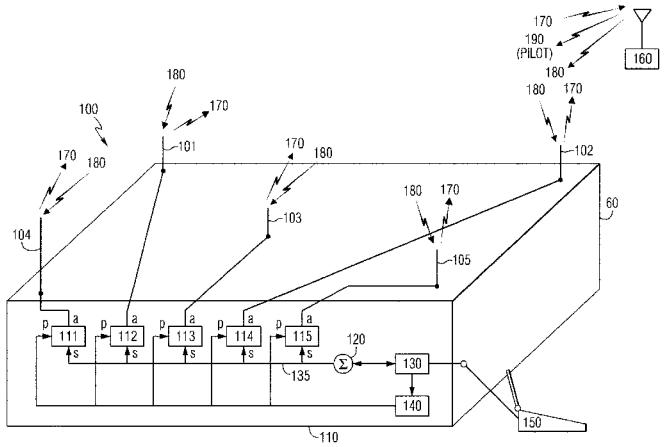
(57) **ABSTRACT**

An antenna apparatus that can increase capacity in a cellular communication system is disclosed. The antenna operates in conjunction with a mobile subscriber unit and comprises a plurality of antenna elements, each coupled to a respective weight control component to provide a weight to the signal transmitted from (or received by) each element. The weight for each antenna element is adjusted to achieve optimum reception during, for example, an idle mode when a pilot signal is received. The antenna array creates a beam former for signals to be transmitted from the mobile subscriber unit, and a directional receiving array to more optimally detect and receive signals transmitted from the base station. By directionally receiving and transmitting signals, multipath fading and intercell interference are greatly reduced. The weights are adjusted in a coarse and a fine mode. In the coarse mode all the weight control components are jointly adjusted or changed so that the antenna beam scans through a predetermined sector of a circle until a signal quality metric of the received signal is optimized. The coarse adjustment mode is followed by a fine adjustment mode during which the weights of are independently adjusted to further optimize the signal quality metric.

42 Claims, 5 Drawing Sheets



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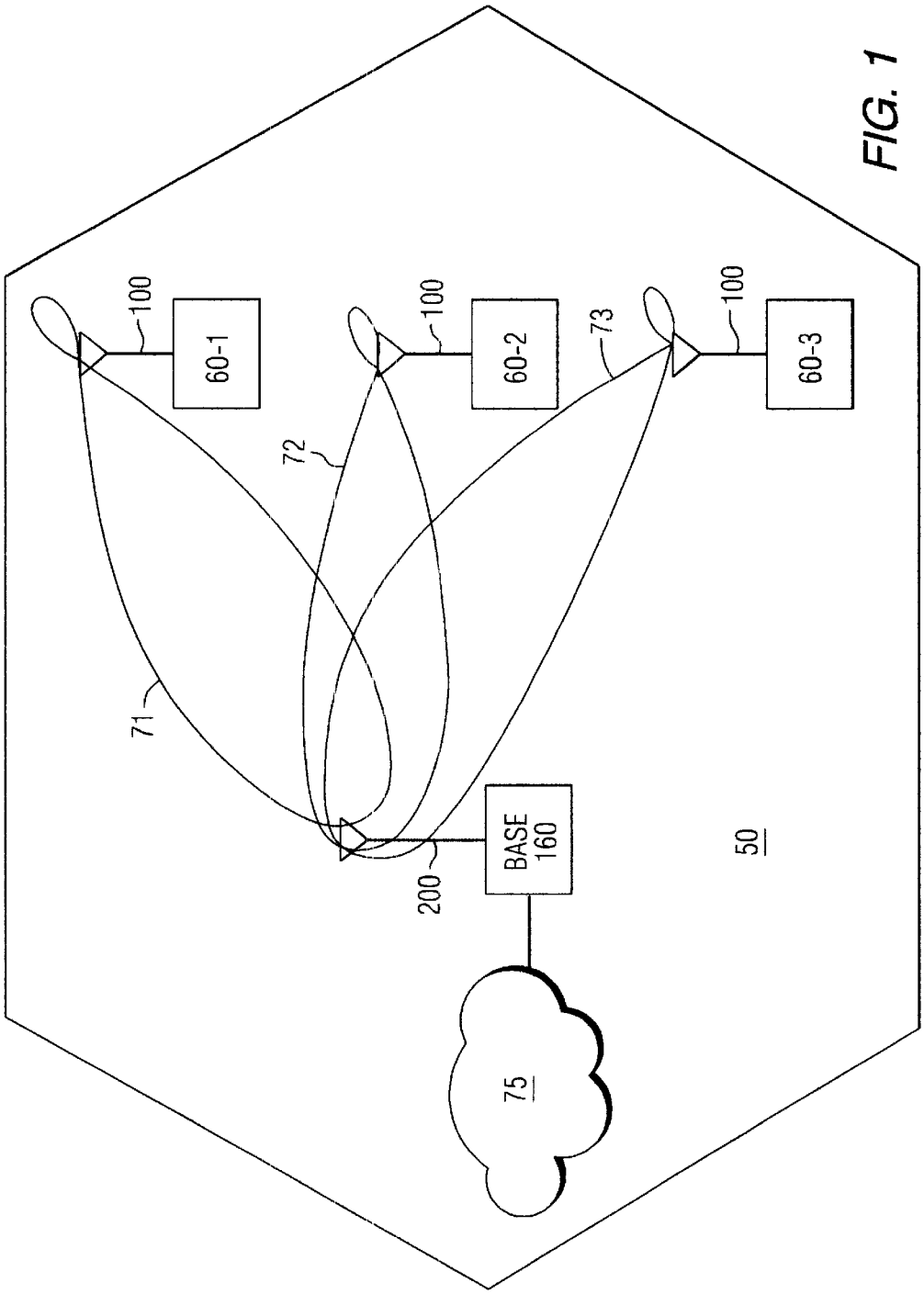

FIG. 1

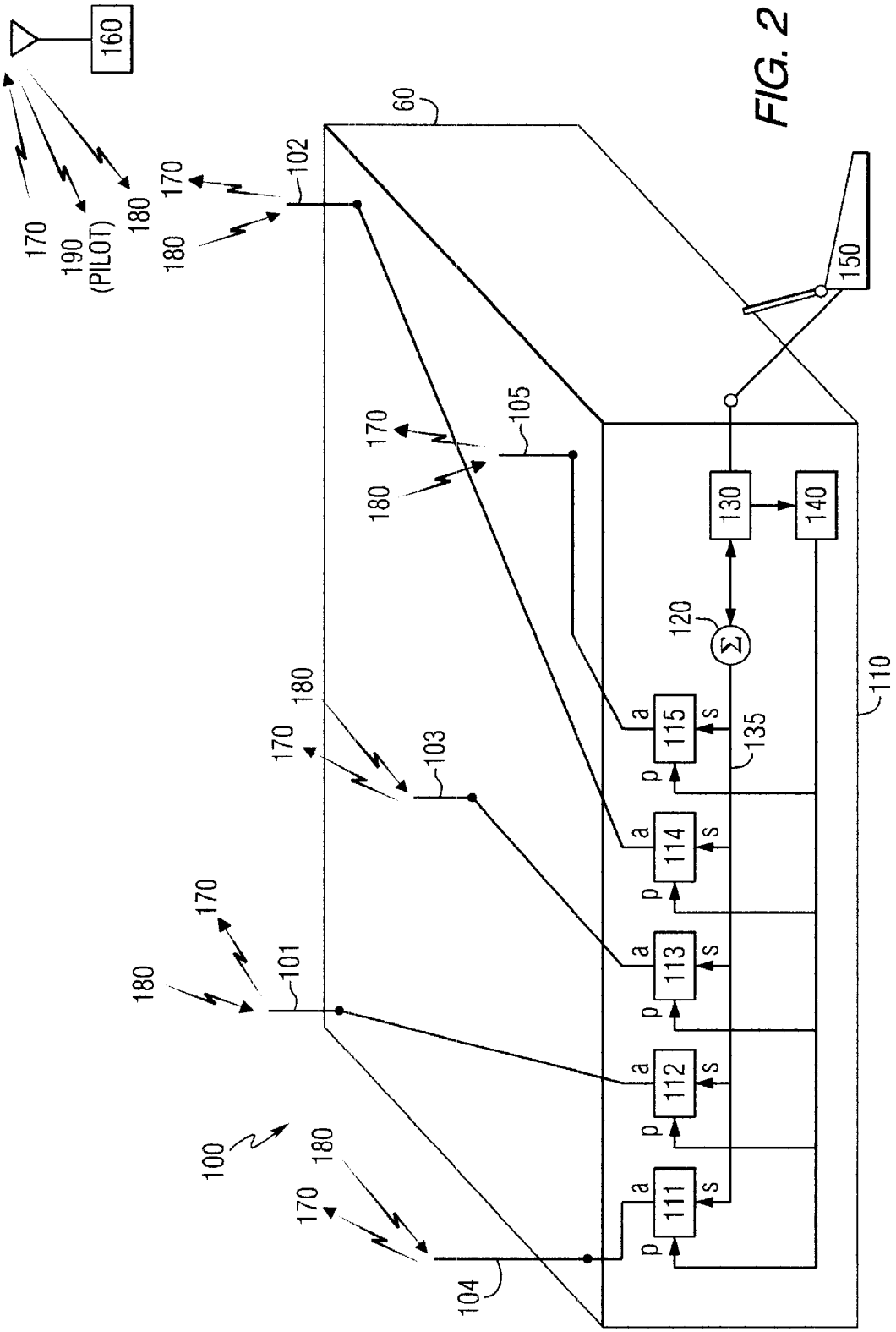

FIG. 2

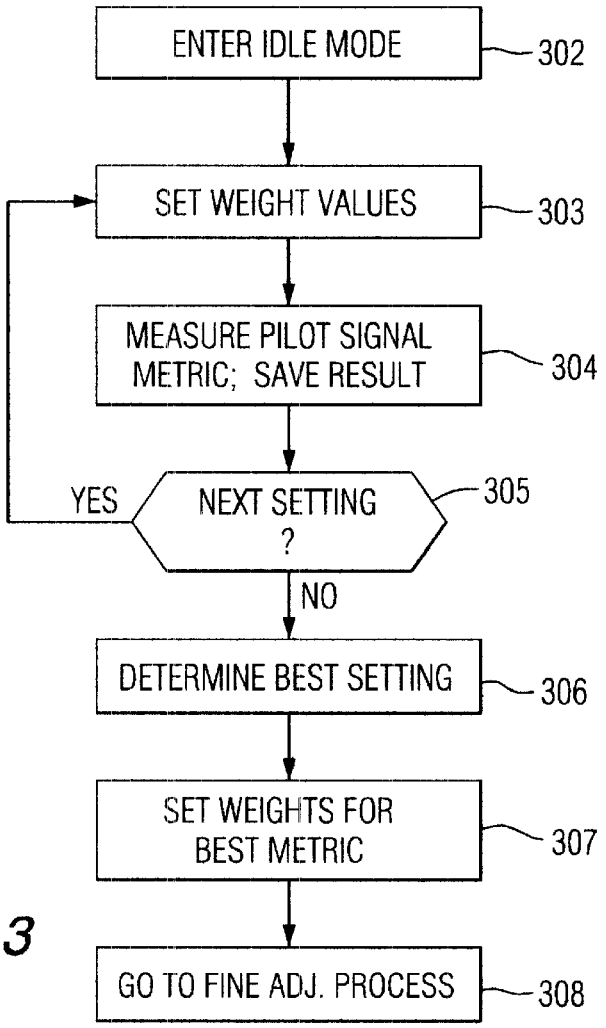

FIG. 3

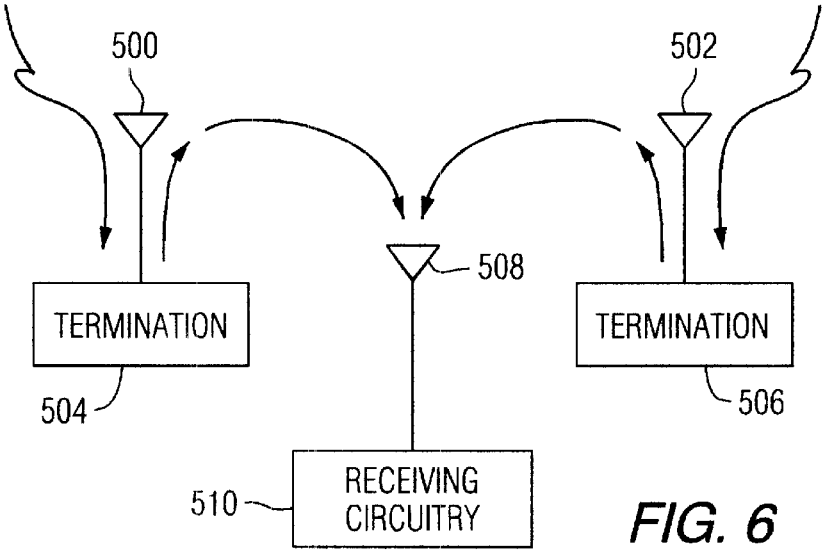

FIG. 6

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